

The Changing Face of Wisconsin Dairy Farms:

A Summary of PATS' Research on Structural Change in the 1990s

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INTRODUCTION

Medium-sized, diversified, family-labor farms¹ have long defined the structure of dairy farming in "America's Dairyland." The red barns, silos, farm houses, and fields of hay, grain, and pasture associated with these operations have given rise to the state's distinctive pastoral landscapes. As family businesses these farms have been successful enough to provide their operators with "middle-class" standards of living. Nationally, in the 20th century, Wisconsin's dairy sector produced more milk and especially more cheese than any other state in the U.S. Among Wisconsin residents, much cultural pride stems from the state's preeminence in dairying — car license plates bear the motto "America's Dairyland," while sports fans are particularly infamous for donning foam "cheeseheads" to identify themselves as from Wisconsin.

Over the last 50 years the dairy farm sector in Wisconsin has witnessed considerable changes in the size of their milking herds, use of production technologies and management practices, and mix of livestock and cropping enterprises. Despite these changes, most dairy farm operations have typically remained at a scale such that they are still operated and managed predominantly by farm household members. Indeed, until quite recently, Wisconsin only had a handful of large dairy farms that rely heavily on hired labor. At the same time, it has typically had fewer "very small" dairy farms typical of some other midwestern or southern states. The distinctive character of Wisconsin dairy farming has been attributed to the state's unique political, cultural, and socioeconomic history (Gilbert and Akor, 1986).

In recent years, a belief has emerged in Wisconsin and throughout the Upper Midwest that the leading role of medium-sized, family-labor dairy operations is ending, and that these operations are

being converted rapidly into large herd, industrial-style dairy farms that will look more like the dairy operations that are typical in California, Arizona, New Mexico, Idaho and other western states (Boehlje, 1997; see also Lyson and Geisler, 1992). As evidence for this trend, observers point to the highly publicized recent construction or expansion of very large dairy farms in the state; the growing number of 200-plus cow herds with modern milking parlors and freestalls; reports that medium-sized dairy farms are financially stressed; and increased rates of net farm losses, especially among farms that milk smaller herds. The view that medium-sized dairy farms are particularly vulnerable and being replaced by larger commercial dairy farms (on the one hand) and growing numbers of small, part-time farms without dairy cows (on the other) is consistent with the overall trend toward a bipolar or dualistic farm structure in U.S. agriculture as a whole (Buttel and LaRamee, 1991).

Many in the farming community and general public have viewed these dairy sector trends in a negative light (Buttel and Jackson-Smith, 1997). Their concerns tend to be directed to the implications for farm families, the vitality of rural towns and communities, rural land use patterns and landscapes, the quality of the state's rural environment, and even the state's economy (Strange, 1988). At the same time, many dairy industry leaders and professionals working with the dairy sector have tended to evaluate the apparent rise of larger scale farms in more positive terms, i.e., as evidence that Wisconsin's dairy sector is taking steps to remain competitive given the advent of new technologies and changing market conditions (Jones, 1999; Palmer et al., 2000). Often overlooked is another large group of industry participants and professionals who see this same structural change as inevitable, even as they worry about its

effects on their own enterprises or activities or about the social and environmental consequences.

Given the importance of dairy products to U.S. regional and national farm economies, surprisingly little empirical research has been undertaken on the recent trends and dynamics of structural change in the American dairy farm sector, other than observing that a rapid transformation is occurring. We draw on data from a wide variety of sources² to explore recent patterns of structural change in Wisconsin dairy farming and compare them to long-term trends in Wisconsin and the U.S.. We also examine the underlying patterns of expansion, entry, and exit which are shaping the evolution of dairy farm structure in the state. What are the forces that underlie recent structural changes? By clarifying the dynamics of what is occurring perhaps we can better anticipate future changes in this critical industry.

THE U.S. AND WISCONSIN DAIRY SECTORS

Aggregate Performance

Over the last several decades, the U.S. dairy industry has experienced the loss of several hundred thousand dairy farms and a decline in total dairy cow numbers. However, productivity growth (per milk cow) was sufficient to increase total milk output (Perez, 1994). Table 1 reports annual estimates of the performance and size structure of the United States and Wisconsin dairy sectors between 1993 and 1998. Herd numbers in the U.S. have fallen by over 25 percent in this 5-year period, while cow numbers are down 4 percent, and productivity increased by 9 percent. Overall milk output increased by 4.5 percent, but saw significant volatility. In Wisconsin, where the largest number of U.S. dairy operations are located, herds were lost at a slightly lower rate than the national average, but dairy cow numbers dropped almost three times as fast, by over 11 percent in 5 years. Because productivity per cow increased more rapidly in Wisconsin than in the U.S. as a whole, the state's milk output remained virtually unchanged over this period.

Any discussion of the aggregate performance of the dairy farm sector in recent years must make

Table 1: Changes in the Size and Production of the U.S. and Wisconsin Dairy Sectors, 1993-1998.

	1998 Total		Changes, 1993-1998			
	USA	Wisconsin	Net Change		Percent Change	
			USA	Wisconsin	USA	Wisconsin
Farms by Herd Size						
Under 30 cows	35,690	4,300	- 22,940	- 2,000	-39.1	-31.7
30-49 cows	25,155	7,300	- 9,655	- 2,990	-27.7	-29.1
50-99 cows	34,277	8,900	- 7,833	- 1,900	-18.6	-17.6
100-199 cows	13,748	1,950	- 882	- 340	-6.0	-14.8
200+ cows	7,560	550	+ 590	+ 230	8.5	71.9
Total farms	116,430	23,000	- 40,720	- 7,000	-25.9	-23.3
Milk Cows (no, 1,000s)	9,158	1,369	- 423	- 174	-4.4	-11.3
Herd Average (lbs. milk per cow per year)	17,192	16,685	+ 1,470	+ 1,880	9.3	12.7
Total Milk Production (millions of pounds)	157,441	22,842	+ 6,805	- 2	4.5	0.0

Source: Milk Cows and Production: Final Estimates, 1994-1997, USDA/NASS Statistical Bulletin #952, 1999; also published figures for 1998 from <http://usda.mannlib.cornell.edu/reports/nassr/dairy/pmp-bb/>.

mention of the tight profit margins and increasingly volatile milk prices that have come to characterize the life of a dairy farmer. Indeed, farmers in Wisconsin and the U.S. received average annual real milk prices³ in the late 1990s that were roughly twenty percent lower than in 1960, and about 40 percent lower than the peak price paid for milk in 1979. More recently, price swings have become extremely dramatic, with a 25-year high and low nominal milk price both recorded during 1999. Overall, low real prices (combined with higher real input costs) have reduced profit margins in dairying and generated pressure to milk more cows in order to maintain levels of income sufficient to support a family. More volatile prices cause monthly income to fluctuate widely, which can adversely affect the

survival of cash-poor beginning farmers, highly indebted farms, and others with high relative fixed costs and little income from off-farm sources.

Changes in the structure and performance of the aggregate dairy sector are also related to broader regional shifts in the geographic location of dairy farming in the United States (Jesse, 1995). Table 2 summarizes the relative importance (in herd numbers, cow numbers, and milk output) of the major dairying regions of the United States. It is apparent that the Western and Southern “industrial” dairy states (listed in the table) have rapidly increased their share of U.S. milk production since 1950, and now produce over a third of U.S. milk with less than 10 percent of the dairy farms. Herds in these states are typically 4

Table 2: U.S. Dairy Sector Characteristics and Changes by Region.

Region	% of U.S. Total					1997 Avg..	
	Total Milk Production			Dairy Farms	Milk Cows	Herd Size	Herd Avg.
	1950	1980	1997	1997	1997	(cows)	(lbs/cow)
Northern Tier States ¹							
(Traditional Dairy Belt)	38.4	45.6	39.6	50.1	40.6	61	16,448
<i>Wisconsin</i>	12.7	17.4	14.3	20.2	15.1	56	16,057
Western/Southern States ²							
(Industrial Dairy Belt)	12.6	21.0	35.0	9.5	31.1	246	19,008
<i>California</i>	5.1	10.6	17.7	2.3	15.0	497	20,197
Corn Belt States ³	21.0	12.5	9.5	16.8	10.2	46	15,694
Mid-South States ⁴	5.8	5.0	3.4	6.1	4.2	51	13,684
<i>ALL OTHER STATES</i>	22.2	15.9	12.5	11.9	14.5	59	15,161
U.S. TOTAL	100.0	100.0	100.0	100.0	100.0	85	16,451

Source: Milk Cows and Production: Final Estimates, 1994-1997, USDA/NASS Statistical Bulletin #952, 1999.

Notes:

¹ Wisconsin, New York, Pennsylvania, Minnesota, Michigan, Vermont.

² California, Texas, Washington, Idaho, New Mexico, Florida, Arizona, Oregon.

³ Ohio, Iowa, Missouri, Illinois, and Indiana

⁴ Kentucky, Virginia, and Tennessee

to 5 times larger than average herds in other regions and tend to have noticeably higher levels of productivity per cow. The rise of this industrial dairy region has come while dairies in the Corn Belt and Mid-South regions saw significant declines in herd numbers and milk output.

It is worth noting that while the Northern Tier states in the traditional dairy belt have lost market share since their peak in 1980, in 1997 they still had over half of U.S. dairy farms and produced almost 40 percent of the nation's milk. As we will argue below, the dynamics of dairy farm structural change in Wisconsin — while not particularly indicative of trends in the industrial dairy states — are representative of how dairy farming is changing in the rest of the important U.S. dairy farm regions, and can provide critical insights into the pace and direction of future changes in the U.S. sector overall.

Changing Size Structure

The overall shift towards larger dairies in the U.S. and industrial dairy states is viewed by some as evidence that the traditional family-scale dairy farm is an anachronism. While the total number of U.S. dairy operations fell by almost 41,000 between 1993 and 1998, the rate of net decline was significantly higher among smaller dairy operations (Table 1). Farms with less than 30 dairy cows lost almost 40 percent of their numbers — or almost 23,000 farms — over the last 5 years, while net losses of farms with 30-49 and 50-99 cows were somewhat slower. The largest farms (those with over 200 cows) actually increased in number.

In Wisconsin, the rates of net decline were generally under the national average for farms with less than 100 milk cows, but higher than average among those with between 100-199 cows. Almost 5,000 of the net decline of 7,000 dairy farms in Wisconsin occurred among dairies with under 50 cows. At the other end of the spectrum, Wisconsin saw its number of farms with over 200 cows nearly double. Of course, Wisconsin's rapid rate of increase in this category is partly a reflection of the relatively low numbers of farms they had in this size class in 1993 (relative to the overall size of its dairy sector), and the fact that many 100-199 cow operations increased their herd sizes across the 200-cow threshold during this period.

The effect of these different rates of decline

has been to produce an increasingly concentrated dairy farm sector in the U.S. and Wisconsin. As noted in Table 3, U.S. dairy herds with under 50 cows still dominate (in terms of share of operations), but they declined from 59.5 percent of all dairy farms in 1993 to 52.3 percent in 1998. While numerous, their share of U.S. milk output has declined to less than 10 percent of the total. Since their numbers decreased less than the overall average, the mid-sized U.S. dairy herds (with between 50-99 milk cows) actually increased as a share of all operations (from 26.8 to 29.4 percent), but their share of total milk production fell slightly. Meanwhile, the largest dairy farms in the U.S. (those with over 100 cows), increased as a percent of all operations, and their share of milk output rose considerably. The role of the roughly 2,500 very large U.S. dairies (with over 500 cows) is particularly noteworthy, since they accounted for just over 2 percent of the farms but produced 30 percent of all milk in 1998. When you include farms with between 200-499 cows, the largest 7,500 dairies now produce almost half of all the milk in the United States.

When compared to the U.S. totals (Table 3), Wisconsin has proportionately fewer very small (under 30 cow) and very large (over 200 cow) dairy operations. Currently, farms milking between 30 and 99 cows represent roughly seventy percent of all Wisconsin dairy operations. What is surprising to many observers is that this same group currently owns almost two-thirds of all the milk cows and produces sixty-two percent of the milk in the state. Relatively large farms (those with over 200 cows) represented just two percent of the herds in 1998, but — due to their larger scale — produced fourteen percent of the state's milk. Very large, industrial-scale operations are even less common. For example, out of the more than 21,000 Wisconsin dairy farms in 1999, fewer than fifty were large enough to require manure storage permits from the state's Department of Natural Resources (permits are required on farms with more than 1,000 "animal units," which corresponds to roughly 700 milk cows).

There is an important cohort of operations in the 100-199 herd range who represent nine percent of the operations in the state and produce twenty-one percent of the milk. Their technology adoption patterns tend to be more like the larger operations (over 200 cows) than the operations with under 100 cows. Yet, most of these operations are still managed

Table 3: Size Structure of Wisconsin and United States Dairy Farm Sector, 1998.

	United States	Wisconsin
	<i>(percent)</i>	
Dairy Farms by Herd Size Class		
Under 30 cows	30.7	18.7
30-49 cows	21.6	31.7
50-99 cows	29.4	38.7
100-199 cows	11.8	8.5
200-499 cows	4.4	2.1
500 cows or more	2.1	0.3
<i>total</i>	<i>100.0</i>	<i>100.0</i>
Milk Produced by Herd Size Class		
Under 30 cows	2.1	3.1
30-49 cows	7.1	21.0
50-99 cows	24.0	41.0
100-199 cows	20.0	21.0
200-499 cows	16.8	10.0
500 cows or more	30.0	3.9
<i>total</i>	<i>100.0</i>	<i>100.0</i>

Source: Milk Cows and Production Reports: <http://usda.mannlib.cornell.edu/reports/nassr/dairy/pmp-bb/>

Note: See Table 1 for total farms and total production figures.

and worked primarily by family members (often in partnerships or family corporations). In terms of labor provision, these farms are frequently the combination of two single-family operations of under 100 cows, and thus might well be considered “medium-sized” operations. Depending on their propensities and intentions to grow, which are explored below, these farms reflect a mix of operations in transition to larger scale and those content to remain at or near their current size.

Clearly, despite rapid changes in dairy farm structure in the 1990s, the medium-sized family-labor dairy farm using traditional production technologies remains the backbone of the Wisconsin dairy sector (as well as in most of dairy states outside of the industrial dairy regions in the west and south). Why this is the case is addressed later in this paper. First, we turn to a more detailed consideration of the dynamics of structural change — the patterns of dairy herd expansion, entry, and exit.

While national and regional data provide a broader context for understanding structural change among Wisconsin dairy operations, it is apparent that Wisconsin’s experiences are representative of most of the important states in the traditional dairy belt. Figure 1 reports the number of farms and dairy farms in Wisconsin that were counted as part of the periodic U.S. Census of Agriculture. While overall farm numbers have declined steadily since 1959, the numbers of dairy farms have fallen much more rapidly. Indeed, between 1959 and 1997, Wisconsin saw a net loss of roughly three-fourths of its dairy operations. While in 1959 almost 4 out of 5 farms in Wisconsin were milking cows, by 1997 only about a third of Wisconsin farms remained in dairying. A close look at Figure 1 reveals two periods of rapid decline in dairy farm numbers, one in the 1960s/early 1970s, the other since the mid-1980s.

Although declining dairy farm numbers have characterized Wisconsin agriculture for most of this

Trends in the Wisconsin Dairy Sector

century, it was usually the case that gradual increases in the scale of the remaining farms, combined with growth in productivity, were sufficient to increase total milk output year after year. Figure 2 provides a graphic illustration of long run trends in herd and cow numbers, milk output, and prices received among Wisconsin dairy farmers since 1960. Expressed as a percent of their 1960 value, the data suggest that the number of dairy herds has declined steadily over the last forty years to twenty percent of its 1960 value. Meanwhile, the number of cows milked has fallen less rapidly, to about sixty percent of its 1960 level. Because of rising productivity, the total output of milk continued to increase in Wisconsin well into the

1980s, peaking in 1988, and has either declined or remained essentially stagnant since that time. Milk prices (when adjusted for inflation) peaked in 1979, and have generally declined every year since that time. Farmers now receive real milk prices that are twenty percent lower than those they received in 1960, and about forty percent below the peak price in 1979. The net effect is that the real value of total milk receipts to all Wisconsin farm operators also peaked in 1979 and is now at a level similar to that found in 1960.

The more recent monthly milk price statistics

Figure 1: Number of Farms and Dairy Farms in Wisconsin, 1959-1997.

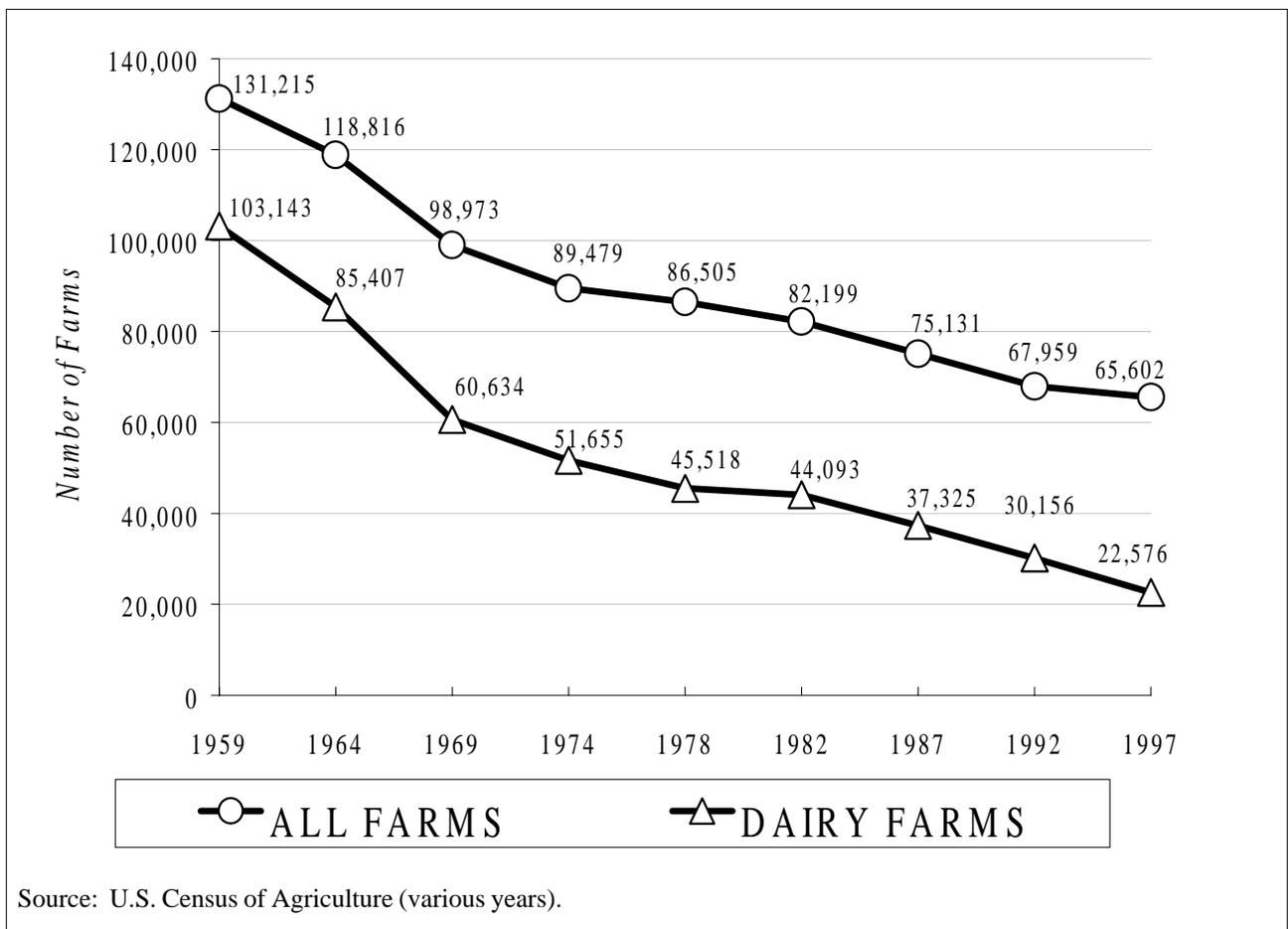
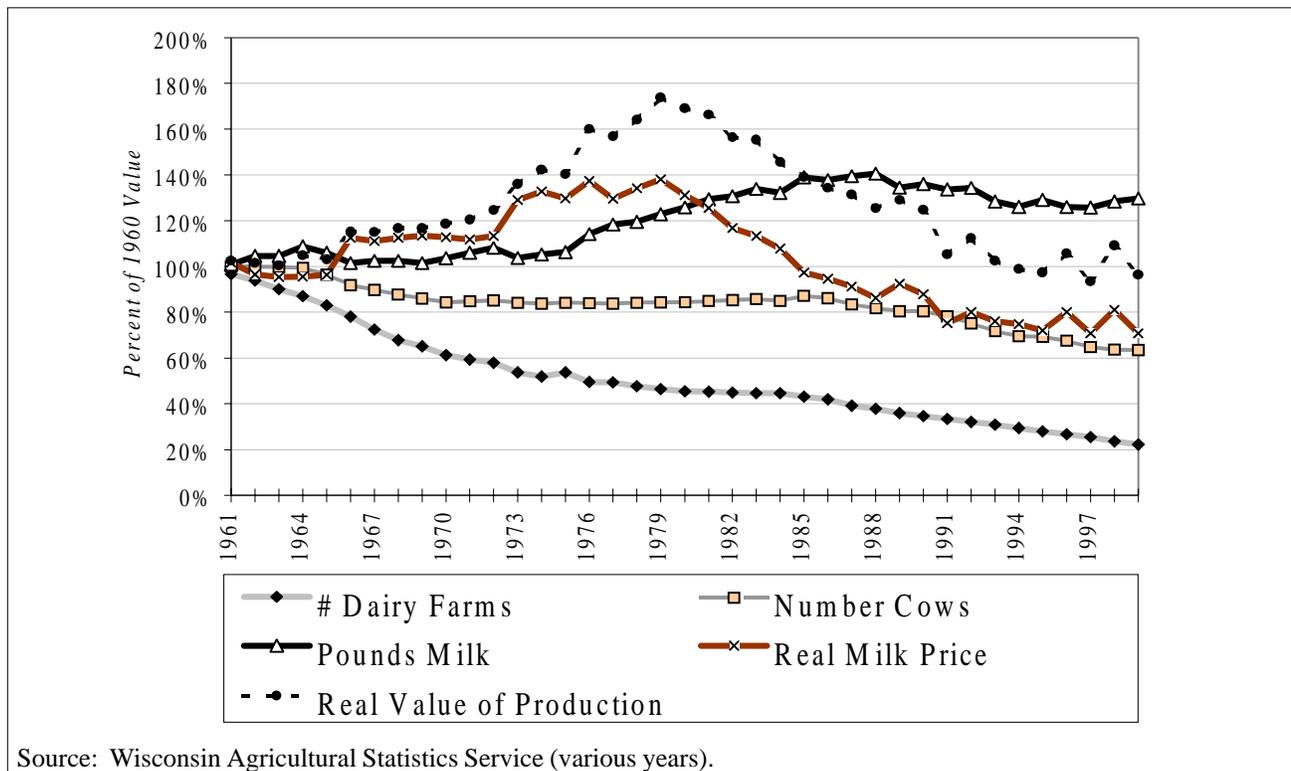


Figure 2: Economic Indicators of Wisconsin's Dairy Industry, 1960-1999.



illustrated in Figure 3 underscore another important trend in the economics of dairy farming: increasing price volatility. Indeed, although annual average milk prices in 1996 and 1998 were well above the historical average (in nominal terms), there were unprecedented spikes and troughs in the prices farmers received for their milk in the fall/winter of 1996/97 and 1998/99. Another prolonged price trough is currently occurring in the winter of 1999 and spring of 2000. The reasons for increased volatility in milk prices include the steady withdrawal of price supports, supply shocks (especially from the Western states), and a more inelastic demand for milk products in the U.S. (with rising incomes and increasing consumption of milk products in processed foods and away-from-home outlets). This price volatility means that the monthly incomes of most dairy farmers have also fluctuated considerably since 1995, as relatively few dairy farmers yet utilize (or have access to) recently-developed forward contracts or other risk-hedging options. Thus, unless they have saved enough during high-price periods, some dairy farmers can find these low price troughs to be significant short-term threats to the survival of their operations (especially those faced with high debt repayments or other fixed expenses or with high dependence on their monthly income for family living expenses). This increased volatility of prices may also discourage

entry because of the negative effects of increased uncertainty on investment decisions (Barham and Chavas, 1999).

Although national and state data suggest that large farms are becoming more important in the dairy sector, it is important to examine carefully the actual trends in herd growth and size. Though expansion is often discussed as a relatively contemporary phenomenon, Figure 4 shows that dairy herds have been steadily growing larger in Wisconsin and the U.S. since 1950. In fact, the typical Wisconsin dairy herd has quadrupled in size over the last forty years — from fifteen cows in 1950 to almost sixty cows today. Average-sized U.S. dairy herds have increased from less than 10 cows to almost 80 cows per farm over the same period. When annualized rates of growth are considered, the average Wisconsin and U.S. herd size has been increasing by roughly three and five percent a year, respectively, in almost every period since the 1950s. Somewhat surprisingly (given the heightened attention to dairy herd expansion activity in the state and nation in recent years), by historical standards the 1990s have seen relatively slow annual rates of growth in the average size of U.S. and Wisconsin dairy herds, though Wisconsin's rate slowed more than the nation's as a whole.

Figure 3: Monthly All Milk Price Received by Wisconsin Dairy Farmers, January, 1993-June, 2000.

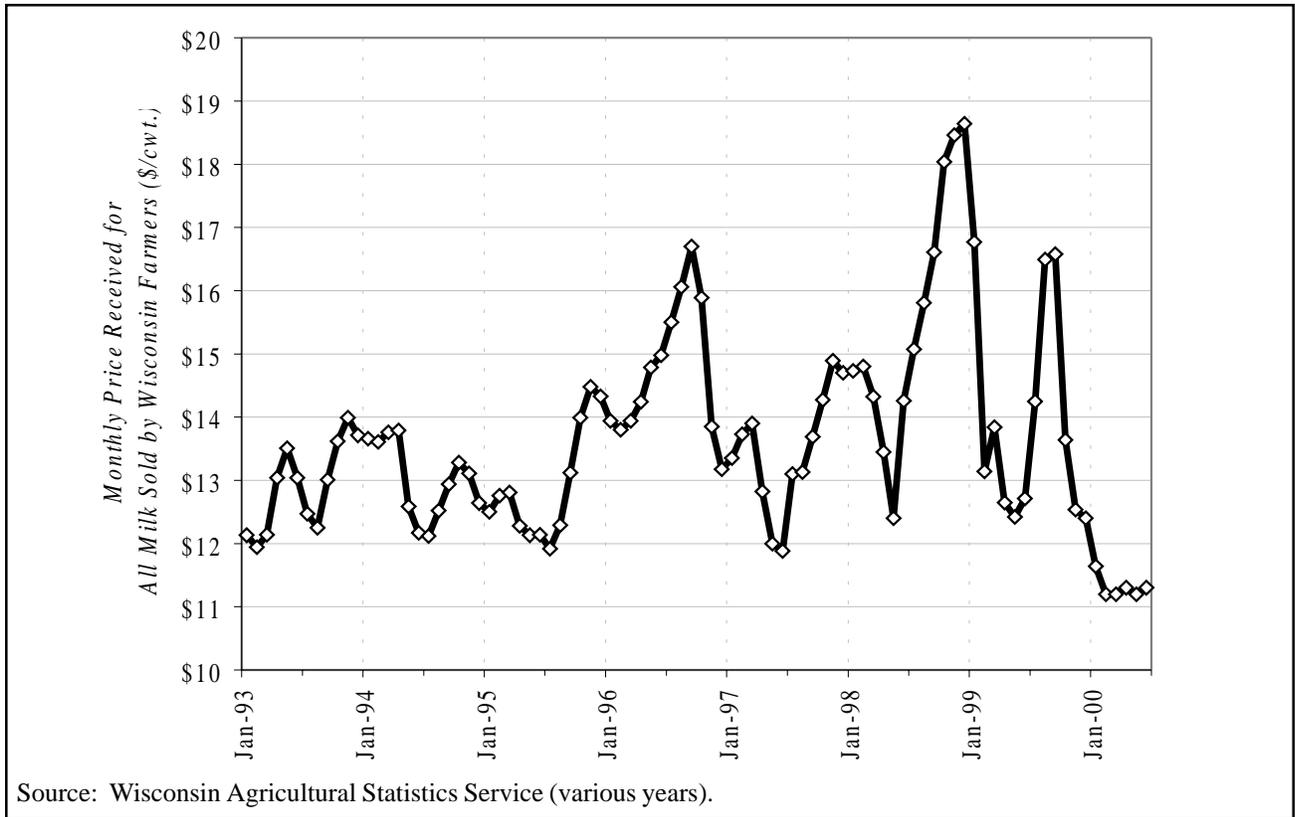
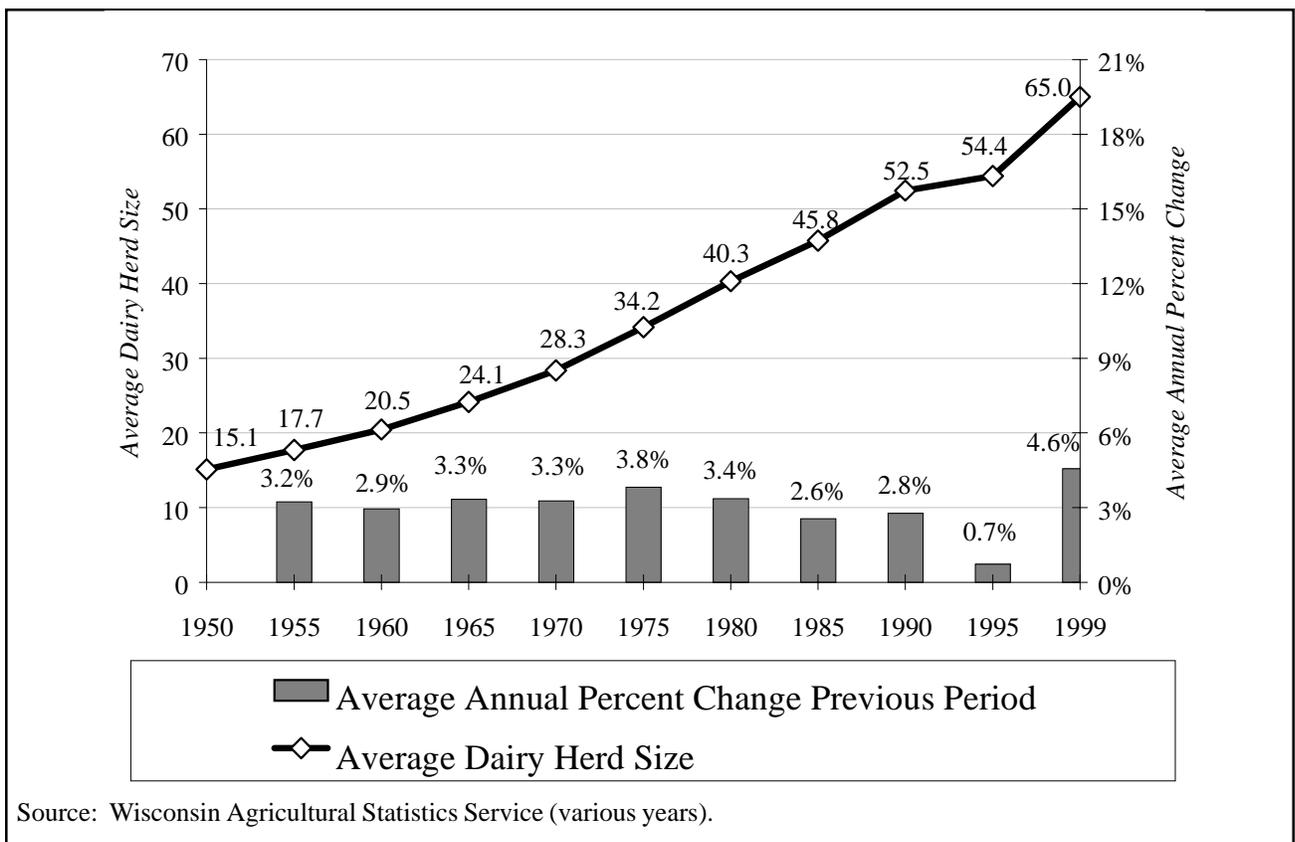


Figure 4: Average Size and Annual Growth Rate of Wisconsin Dairy Herds, 1950-1995.



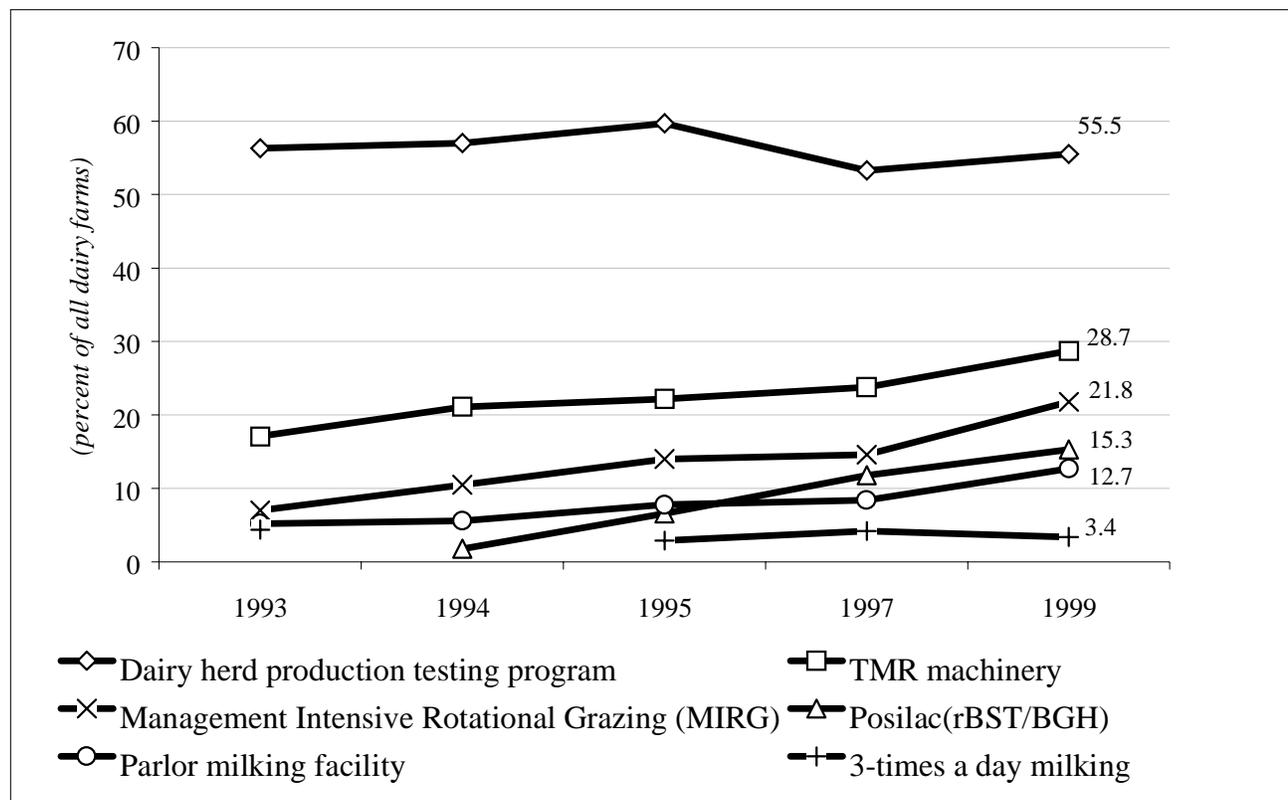
Another form of dynamism in the dairy sector reflects changes in the production technologies and management practices employed on modern dairy enterprises. It is well established that the scale of operation and production practices on “typical” dairy farms in Wisconsin has changed dramatically over the last 50 years. In contrast to their predecessors in the 1940s and 1950s, virtually all dairy farms now milk well over 30 cows in barns that are outfitted with automatic milking machines, pipelines, and bulk milk tanks. State statistics also suggest that the use of artificial insemination has increased from just over half of all herds in the late 1960s, to roughly 80 percent of herds in the 1990s (WASS, various years). In 1964, just over 20 percent of herds reported the use of production records on individual cows (typically associated with the Dairy Herd Improvement Association, or DHIA). This number increased to over half of all herds by the 1990s.

More recent trends underscore both a continued dynamism and the uneven spread of new technologies among Wisconsin dairy operations (for more detailed analysis and data, see Buttel et al., 2000; Barham et al., 2000). Figure 5 illustrates the percentage of Wisconsin dairy farm enterprises who

reported the use of several important dairy technologies or practices between 1993 and 1999. While adoption of individual cow production record keeping appears to have leveled off just between 50-60 percent of all farms, the use of most other technologies increased steadily throughout the 1990s. The use of Total Mixed Ration (TMR) machinery and parlor milking facilities both nearly doubled from 1993 to 1999, and the use of a bioengineered hormone that boosts milk production (rBST) increased from 2 percent of herds in 1994 (the year it was first available) to over 15 percent in 1999. Perhaps most unexpected has been the increased use of Management Intensive Rotational Grazing (MIRG) among Wisconsin dairy farmers, which roughly tripled from 7 percent of farms in 1993 to almost 22 percent in 1999.

Although most of the practices included on Figure 5 reflect relatively well known technologies that are nearly universally recommended to farmers by university scientists and industry leaders, it is notable that under half of all dairy farmers in the state were still using most practices at the close of the 20th century. In 1999, for example, slightly less than a third of farmers were using TMR machinery, only 15

Figure 5: Percent of Wisconsin Dairy Farms Using Different Production Technologies, 1993-1999.



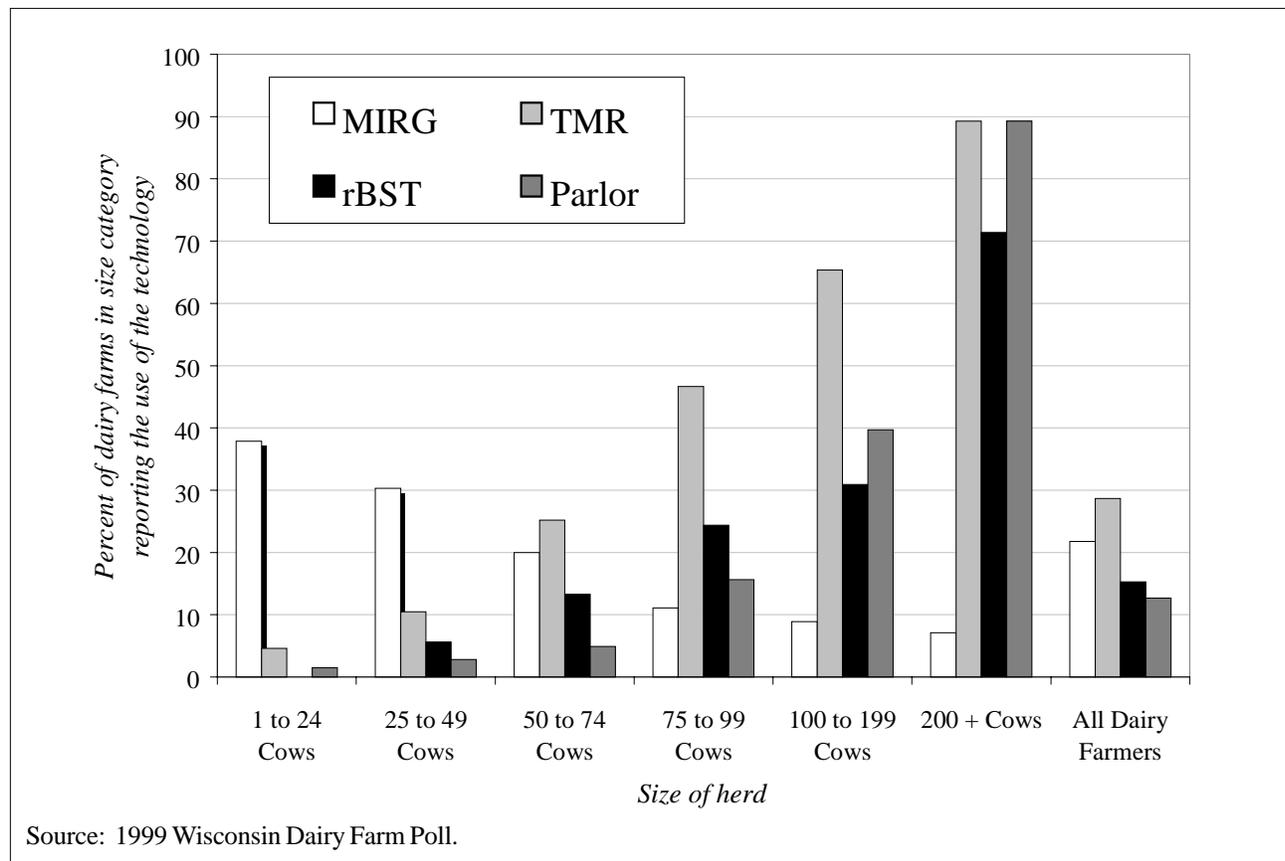
percent reported using rBST, and roughly 1 in 8 farms were milking cows in a parlor facility. Management Intensive Rotational Grazing (or MIRG) has become much more common than many experts had predicted at the outset of the decade, but is still used by only a minority of operators.

While the overall levels of adoption of most new dairy practices has increased in the 1990s, analysis of the PATS survey data also suggests that adoption rates differ dramatically by size of milking herd. As shown in Figure 6, there is a general pattern in which larger operations are more likely to use new productivity enhancing and labor saving technologies than their smaller neighbors. For example, while less than 10 percent of herds with under 50 cows used TMR machinery, rBST, or milking parlors, these practices were nearly universal among herds with over 200 cows in our 1999 survey. By contrast, the use of MIRG is much more common among the smaller herds in the state.

DYNAMICS OF STRUCTURAL CHANGE

Aggregate changes in the dairy sector reflect the combined impact of three very distinct processes. First, they mirror any changes in the way **existing** dairy farms are organized and operated, particularly efforts to expand the size of dairy herds. Second, they are influenced over time by the characteristics of new dairies started or taken over by the next generation of **entering farmers**. If, for example, new dairies tend to be larger than average, then adding them to the sector will produce an increase in the average farm size overall. Finally, the aggregate changes in farm structure are also influenced by the decisions of individual farm operators to **exit** dairy farming. For example, if farms that are ceasing to milk cows tend to have smaller herds, then their exit from the sector will *ceteris paribus* create an increase in the average size of the remaining farms.

Figure 6: Adoption of Various Dairy Technologies by Size of Herd, 1999.



Dynamics of Dairy Herd Expansion

Perhaps the most important type of structural change made by dairy farm operators is the decision to expand the size of their herd.⁴ In order to express the incidence of different types of herd expansion in Wisconsin, we surveyed over 1,000 Wisconsin dairy farm operators in 1997 and asked them how many cows were in their milking herd last year (in 1996), five years ago (in 1991), and how many they expected to be milking in 2001.⁵ Our findings (Table 4) suggest that herd expansions were relatively common in the early 1990s, with almost 44 percent of Wisconsin dairy herds increasing their cow numbers by 5 percent or more. Looking forward, only a third of the dairy farms expected to stay at the same herd size for

the next 5 years. Interestingly, almost a quarter of Wisconsin dairy farm operators were planning to exit or milk fewer cows by the year 2001.

While rate of herd growth is the most common measure of expansion, we also observe (Table 4) how many cows were added to a herd. Relatively few Wisconsin dairy farmers added significant numbers of cows to their herds in the early 1990s (only 3 percent added 50 or more cows, and less than 20 percent added more than 10 cows). This suggests that many of the relatively rapid herd expansions (in percentage terms) actually involved growth from relatively small herd sizes to more medium-sized operations (rather than growth from a medium-sized to a much larger sized operation).

Table 4: Past and Future Herd Expansion Activity, 1997 Wisconsin Dairy Poll Respondents.

Type of Change in Herd Size	Expansion Activity	
	Actual ¹ 1991 to 1996	Planned ² 1997 to 2001
	<i>(percent of respondents)</i>	
Rate of herd size growth		
New Dairy (entered since 1991)	6.7	<i>n.a.</i>
Downsized (more than 5%)	12.8	5.5
Stable (+/- 5%)	36.9	33.9
Slow Growth (5-25%)	25.6	16.5
Rapid Growth (25% or more)	18.0	22.4
Plans to Exit by 2001	<i>n.a.</i>	21.7
Total percent	100.0	100.0
(<i>n</i>)	851	820
Change in cow numbers		
New Dairy (entered since 1991)	6.7	<i>n.a.</i>
Downsized (by more than 10 cows)	3.4	1.7
Stable (+/- 10 cows)	71.3	52.7
Slow Growth (+ 10-49 cows)	15.8	17.5
Rapid Growth (+ 50 or more cows)	2.7	6.4
Plans to Exit by 2001	<i>n.a.</i>	21.7
Total percent	99.9	100.0
(<i>n</i>)	851	820

Notes:

¹ Respondents were asked how many cows they were milking in 1991. New entrants were prompted to write "0" for their 1991 herd size.

² Respondents were asked how many cows they expected to be milking by 2001. People expecting to exit were prompted to write "0" for their expected 2001 herd size.

To further examine expansion trends from 1991-1996 we created a transition matrix (Table 5). Several interesting patterns are observed. First, the overall size distribution of this group of Wisconsin dairy farms changed relatively slowly in the first half of the 1990s.⁶ More than two-thirds of all dairy farms were still in the same size “category” in 1996 as in 1991 (denoted by the cells with dark borders on the diagonal), and most of those that expanded increased by just 1 herd size category. Only 2.3 percent of all dairy operations increased by two or more herd size categories (most of whom were relatively small farms that expanded to between 100-199 cows in 1996.) There is some weak evidence that farms reaching the 200 cow threshold begin to enter a more aggressive pattern of further expansion. Survey respondents reported very similar types of expansion plans when asked how many cows they thought they would be milking by the year 2001.

While incremental expansions on medium-sized dairy farms are numerically the most common in Wisconsin, it is also worth noting how they contribute to dairy cow numbers (and milk output) levels in the state. We divided respondents into three major herd size categories: those with small (under 50 cows), medium (between 50-199 cows), and large herds (over 200 cows). An analysis of farms that increased their cow numbers between 1991 and 1996 suggests that incremental expansion on modest-scaled farms actually brought in two-thirds of the total number of new cows that were added to the Wisconsin dairy sector during this period. Just over half of the cows brought in via herd expansions were on farms that were entering or expanding into the medium-sized category (25 percent of the total) or were associated with expanding medium-sized farms that ended up with less than 200 cows by 1996 (29 percent). Another 17.4 percent of the cows brought in through expansion were introduced on smaller dairy farms that milked less than 50 cows in 1996. Growth among the larger operations was responsible for adding the remaining 33 percent of cows.

Table 5: Estimated Number of Wisconsin Dairies in Each Herd Size Class in 1996, by Herd Size in 1991.

		Size of Dairy Herd in 1996							1991 total
		1 to 24 cows	25 to 49 cows	50 to 74 cows	75 to 99 cows	100 to 199 cows	200 to 499 cows	500 or more cows	
Size of Dairy Herd in 1991	Entered since 1991	264	821	498	59	29	0	0	1,671
	1 to 24 cows	1,173	528	59	0	0	0	0	1,759
	25 to 49 cows	381	7,534	2,052	88	0	0	0	10,055
	50 to 74 cows	0	616	5,306	938	410	29	0	7,299
	75 to 99 cows	0	0	176	1,466	674	0	0	2,316
	100 to 199 cows	29	0	29	147	1,143	264	0	1,612
	200 to 499 cows	0	0	0	0	0	264	29	293
	500 or more cows	0	0	0	0	0	0	29	29
1996 total		1,847	9,498	8,120	2,697	2,257	557	59	25,034
Percent of 1996 herds		7.4	37.9	32.4	10.8	9.0	2.2	0.2	100.0

Source: 1997 Wisconsin Dairy Farm Poll.

Dynamics of Entry

Net declines in dairy farm numbers (discussed above) are often misconstrued to be the number of dairy farms that have “exited” or quit over a given period of time. But the net change is a balance or residual sum of subtracting exiters and adding back new or “entering” farms. We know from various sources of information that there has been a dramatic reduction in the total number of new dairy entrants in Wisconsin and the U.S. over the last 15 years, and that this has accelerated the rate of net farm loss in the sector as a whole. Meanwhile, the increase in average dairy herd size, rising rates of adoption of new dairy technologies and management practices, and the belief that economies of scale are essential have led many industry observers to assume that any successful new dairy entrant in the 1990s would have to start with modern facilities and large herds. Presumably, fewer prospective dairy farmers have the management ability and/or sufficient capital to farm in this modern, large-scale way, and thus some may have been discouraged from pursuing a dairy farm career. Also, America’s relatively robust nonfarm economy has provided the already declining number of farm children with strong non-farm employment opportunities during the last decade.

There has been relatively little study of the characteristics of recent dairy farm entrants in Wisconsin or elsewhere in the United States (Jackson-Smith, 1994; Buttel et al., 1999). In a 1996 study of dairy farm entrants in Wisconsin, we defined an entrant as **someone who owns some or all of the dairy herd on the farm and began making major management decisions on this operation in the previous three years.**⁷ Among the 321 respondents who met this definition, most entrants were found to have started new dairies, while a significant minority were junior operators on a parent’s or some other farmer’s operation. Land ownership *per se* was not a criteria for being considered a new dairy farmer, and almost 40% of our dairy entrant sample actually rented in all of their farmland (Buttel et al., 1999).

The characteristics of Wisconsin’s recent dairy farm entrants and their operations are presented in Table 6 (and are compared to a statewide sample of all dairy farms taken the following spring). The results do not provide evidence that a rapid transformation of Wisconsin’s dairy farm sector is underway. Indeed, if anything, entrants continue to begin in the

old-fashioned way, with operations that are somewhat smaller than the state average and with technologies that are standard on most medium-sized farms. Despite the fact that most grew up on dairy farms, surprisingly few have taken over their parents family farm, and most rely heavily on off-farm employment to make ends meet. While many entrants express the intention to expand their operations, most appear likely to do it gradually.

Compared to other Wisconsin dairy farmers, recent entrants tend to pursue production strategies that minimize fixed investments in land and equipment and use fewer of the “production-maximizing” technologies. Many have followed a “herd-first” acquisition strategy, renting land and building their herd to a scale that fits their goals and their capital and labor resources prior to buying land and major equipment. Almost a third of recent entrants used management intensive rotational grazing, a management practice that requires relatively little investment in facilities or equipment, but rewards specialized management skills and cost-minimizing strategies.

The fact that entrants are, on average, in their mid-30s also suggests that the medium-sized and low fixed investment character of their operations reflect what is or has become possible for most entrants, which is to start modestly and go forward from there. This inference is also supported by the responses of entrants when asked to identify the main obstacles they encountered when entering dairy. The most frequent response, reported by 56 percent as a serious obstacle, was maintaining an adequate cash flow; 32 percent said it was acquiring equity. About 20 percent reported that “evaluating the risks and returns involved in dairying” and “getting loans once I had some equity” were key obstacles. Thus, among a long list of potential obstacles, financial constraints are considered the most serious by new entrants. By contrast, relatively few entrants (under 10 percent) regarded arrangements with parents, herd management skills, or setting up the business organization as serious obstacles to entry.

Overall, recent entrants do not appear to be a source of rapid structural change in Wisconsin. Small- and medium-sized operations predominate among new dairy operations, and careful study has unearthed relatively few “new” dairy farms in the state that started out at a relatively large scale (i.e., greater than 200 milk cows). This is not to suggest

Table 6: Characteristics of Entrants to Dairy Farming in Wisconsin, 1993-1996, Based on 1996 Wisconsin Survey of New Dairy Farm Entrants.

Characteristic	Dairy Farm Entrants (1996)	All Dairy Farms ¹ (1997)
Number of respondents	321	1,019
Average age principal operator (years)	34.3	46.9
Average size milking herd (includes dry cows)	43.9	65.9
Farms by herd size (%)		
0 to 24 cows	25.9	7.7
25 to 49 cows	39.4	36.8
50 to 74 cows	27.2	31.5
75 to 99 cows	4.7	11.0
100 or more cows	2.8	12.9
Total	100.0	99.9
Tenure and labor force (%)		
Operator owns some farmland	60.4	95.1
Operator rents some farmland	57.6	69.1
Employs regular, nonfamily workers	18.4	36.8
Management practices (%)		
Production records kept on individual cows	54.4	66.9
rBST use	5.4	11.8
TMR machinery	16.2	23.8
Parlor milking facility	4.4	9.4
Rotational grazing ²	29.6	14.8
Family Background (%)		
Operator or spouse farm reared	88.2	99.1
Inherited or purchased farm from relative	18.4	61.0
Off-farm work (%)		
Operator works off-farm	33.8	15.4
Spouse works off-farm	40.1	35.4
Either or both works off-farm	55.5	41.0
Source of most household income (%)		
All from farming	34.4	54.1
Most from farming	17.8	38.3
Most from off-farm	47.9	7.6
Total	100.1	100.0

Notes:

¹ = Random sample of all Wisconsin dairy operations conducted by PATS in spring, 1997.

² = Relied on pastures to feed milking cows and moved cows as least once/week to fresh pastures.

that new entrants will remain small forever. Rather their experiences and strategies demonstrate how dairy farming in Wisconsin continues to be dominated by family initiatives, built off of low initial levels of equity and lots of hard work, where some farm families may eventually grow their operations into larger ones.

Dynamics of Exit

Patterns of exit from Wisconsin's dairy sector provide additional insights into the forces of farm structural change in the 1990s. Studies of Wisconsin dairy farms over time (Cross, 1994; Jackson-Smith, 1995; Jackson-Smith et al., 1999) suggest that gross exit rates often exceed 7 to 10 percent per year, and there are usually considerably more farms closing their doors than new operations entering across the state (hence the longstanding decline in farm numbers noted above). Many of those who quit dairying remain in agriculture, however, often raising beef cattle, dairy heifers, or crops. Others either look for work outside of the farm sector, or begin their retirement.

It is widely assumed that farmers who have decided to quit dairy farming are largely doing so because they are no longer able to compete economically. Similarly, higher rates of farm loss among smaller dairy operations is also taken as evidence to support the importance of economies of scale favoring farms at the larger end of the size spectrum. Yet, while closing a dairy farm may often be an emotionally painful and difficult process for farm families, many farm families quit not so much because they cannot survive economically, but rather because age, health, or the lack of a successor make it difficult for them to make the financial and labor investments necessary to keep the operation. Also, as Bentley and Saupe (1990) show, some farmers quit when better opportunities arise outside of dairy farming. Since a farm's structural characteristics may be associated with the farmer's age (older farmers who are nearing retirement tend to operate smaller herds with less debt and lower levels of investment in new facilities), it is possible to confuse the effects of normal lifecourse events (like retirement or better opportunities) with an underlying process of structural transformation based on the economic competitiveness of the farms (Jackson-Smith, 1995).

In order to characterize the farms that had closed out their dairy operations recently, we tracked

the fate of roughly 300 dairy farmers between 1995 and 1997. We found that smaller dairies were indeed much more likely to exit than larger dairies (Table 7). Operations with under 40 cows in 1995 contributed more than half of the total exits over the two-year study period. At the same time, exit rates were much lower among farms with more than 100 cows. The strong association between herd size and exit rates underscores a point raised earlier that exits can be a primary basis for dynamic changes in the size structure of the dairy sector. However, inferring that scale of operation is the main determinant of exit can be potentially problematic. As Table 7 shows, there are many other characteristics of farms, farm operators, and farm households that might be influencing exit outcomes.

The most important factor associated with the closing out of dairies is the age of operator (Table 7). Relatively young operators were also somewhat more likely to exit, perhaps because they have higher levels of debt, less experience, fewer fixed investments, and more non-farm job opportunities than well established dairy farmers. Farm operators entering their mid-career phase (40-55 years old) were the least likely to exit. Meanwhile, those in the later stages of their careers (over 55) were by far the most likely to exit, underscoring the importance of normal lifecourse events (retirement, health problems, and transition of a farm to a new generation) in determining the fate of a farm operation.

We also found interesting non-linear associations between exit rates and indicators of debt leverage, household income and participation in off-farm work. While it is not too surprising that those who are highly leveraged are more likely to fail, the increased rate of exit among those with no debt likely reflects the typically debt-free status of late-career farmers preparing to retire. Participation of operators or their spouses in off-farm work seems to increase the chances that a farm operation will quit dairying. Where households have very low income and no off-farm job, it is likely that the lack of sufficient farm income (and the absence of outside sources of income that can pay for living expenses) make farms particularly vulnerable. Alternatively, while a farm household member's off-farm employment may provide income and benefits that can enhance the farm's viability, it also links the household to opportunities in the community and can facilitate the process of closing down the dairy operation.

Table 7: Rate of Exit from Dairy Farming, 1995-1997, by Various Farm and Household Characteristics, Wisconsin Longitudinal Dairy Farm Study.

	% of all farms in longitudinal panel sample	% exiting between 1995-1997
ALL HERDS	100.0	16.1
Herd Size (1995)		
Under 20 cows	5.4	25.0
20-39 cows	32.0	21.2
40-59 cows	34.7	14.0
60-79 cows	13.2	14.7
80-99 cows	7.8	12.5
100 or more cows	7.0	2.8
All Farms	100.0	16.1
Operator Age (1995)		
Under 35	13.9	11.3
35-39	13.1	14.9
40-44	20.9	15.0
45-49	12.3	12.7
50-54	11.9	8.2
55-59	11.4	19.0
60-64	9.6	32.7
65+	6.8	25.7
All Farms	100.0	16.1
Debt-to-Asset Ratio		
No farm debt	20.5	21.0
Debts <= 10% assets	11.5	11.9
Debts = 11-39% assets	26.5	12.5
Debts = 40-59% assets	25.3	13.8
Debts = 60% assets or more	16.2	22.9
All Farms	100.0	16.1
Household Income Total		
Less than \$10,000	16.5	18.1
\$10,000-\$19,999	25.2	15.7
\$20,000-\$34,999	27.0	11.8
\$35,000-\$49,999	16.1	14.8
\$50,000-\$74,999	7.9	17.5
\$75,000 or more	7.3	29.7
All Farms	100.0	16.1
Household Labor Force Status		
No off-farm employment	59.9	14.9
Operator has off-farm job	6.3	18.2
Spouse has off-farm job	28.2	15.8
Both work off-farm	5.6	33.3
All Farms	100.0	16.1

Note: Based on panel of 294 dairy farms responding to surveys in both 1995 and 1997.

To explore the interaction of size structure and lifecycle issues, we calculated the overall rate of exit for various combinations of herd size and operator age categories. As shown in Table 8, among the group of early career farmers, exit rates decrease with increases in herd size, except for a slight jump among those recent entrants with over 100 cows in 1995 (which may be an artifact of a small sample). This pattern suggests that young dairy operators below a certain scale may have trouble keeping their operations solvent and/or providing for family living expenses. Mid-career farmers (age 40-55) are the least likely to exit. Because they are so numerous, however, they do account for just over a third of all exiting farms (see the bottom of Table 8). Among this group, exit rates did not vary as systematically by herd size (see the upper part of Table 8).

Late career farmers (those over 55 in 1995) are the most likely to exit, comprising as they do almost 43 percent of all exiting farms in our study. As with the other age groups, exit rates among these older farmers are highest on the smallest farms, but are above average on all farms except those with more than 100 cows. Interestingly, none of the mid- and late-career farms with over 100 cows left dairying during the study period. It is likely that the financial and intergenerational commitment to dairy farming associated with expanding to larger herd sizes makes it less likely that the operator will voluntarily close down the dairy (although it is also possible to view this difference as evidence of the relative competitiveness of these operations).

Table 8: Rate of Exit and Percent of all Exiting Farmers, 1995-1997, by Age of Operator and Herd Size, Wisconsin Longitudinal Dairy Farm Study.

Size of Herd in 1995	Age of Operator in 1995			
	Under 40	40-54	55+	All Ages
	Rate of Exit, ¹ 1995-1997			
Under 20 cows	25.0	12.5	31.3	25.0
20-39 cows	16.0	15.4	40.5	21.2
40-59 cows	11.8	11.1	21.4	14.0
60-79 cows	12.5	15.2	16.7	14.7
80-99 cows	0.0	12.5	21.4	12.5
100 or more cows	14.3	0.0	0.0	2.8
All farms in sample	13.8	12.6	25.0	16.1
	Percent of all Exiting Farmers, ² 1995-1997			
Under 20 cows	1.2	1.2	6.1	8.5
20-39 cows	9.8	14.6	18.3	42.7
40-59 cows	7.3	11.0	11.0	29.3
60-79 cows	2.4	6.1	3.7	12.2
80-99 cows	0.0	2.4	3.7	6.1
100 or more cows	1.2	0.0	0.0	1.2
All farms in sample	22.0	35.4	42.7	100.1

Note: Based on panel of 294 farms responding to surveys in both 1995 and 1997.

¹ Percent of panel farms in each cell that ceased milking cows during study period.

² Percent of all panel farms that exited during the study that are in each cell

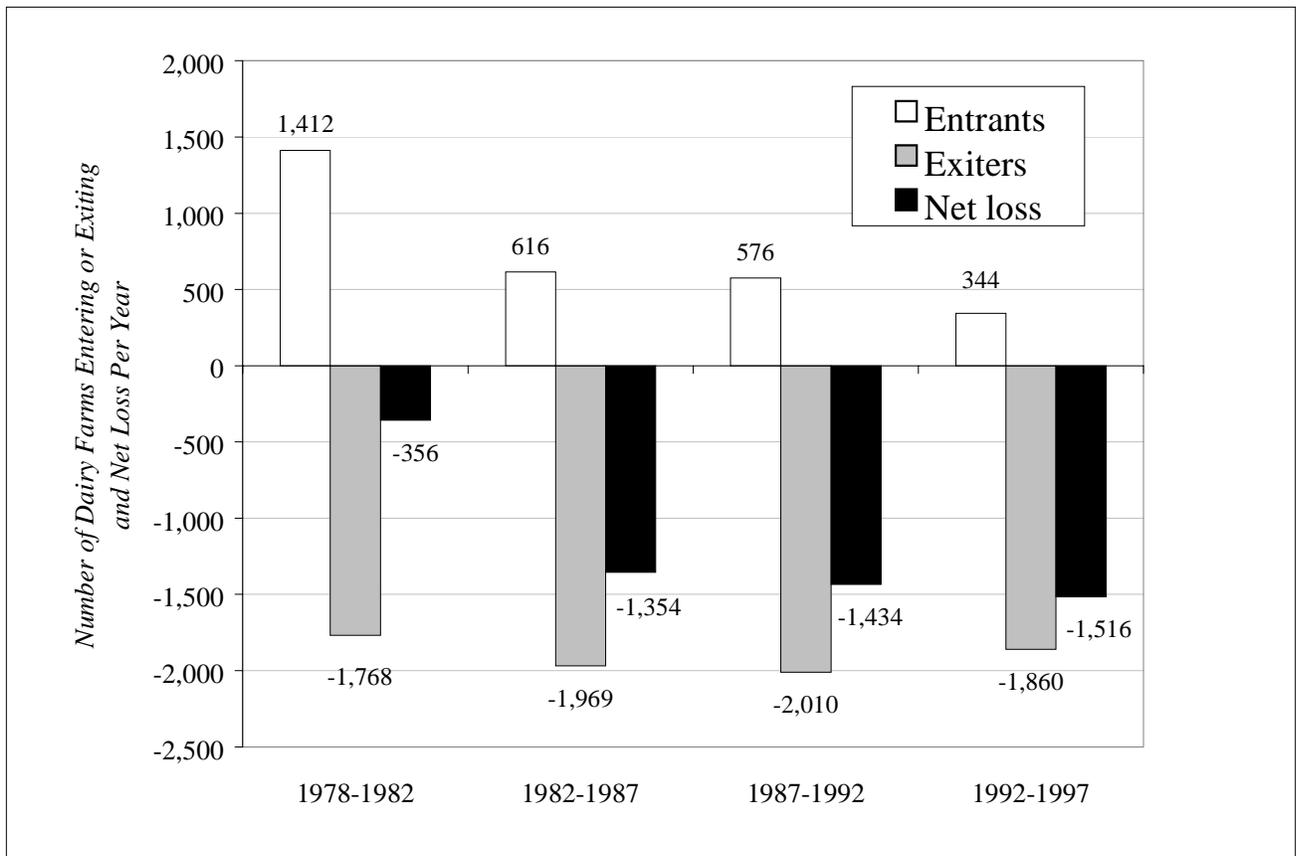
Overall, our exit data strongly suggest that much of the decline in smaller-size farms (more than 40%) can be viewed as part of a lifecycle process that involves retiring farmers who may have wound down their operations over time. Another group of small and mid-sized exiting dairies represent younger farmers who face significant challenges in their first few years of operation. What is not clear from these results is the degree to which these farmers were “pushed” out by lack of competitiveness or “pulled” out by alternative opportunities, especially during this past decade when labor markets in Wisconsin were very tight (i.e., rising wages, low unemployment). Smaller-scale operators may have found it easier to exit, both because they had not sunk as much investment into their farms and because they may have already had a solid footing in off-farm labor markets. Put differently, operators of smaller farms may be more likely to exit (and those with larger herds may be less likely to exit) for reasons other than economic competitiveness.

Balancing Entry and Exit Trends

Since entrants do not seem to represent a “new breed” of dairy farmers in Wisconsin, and because most continuing farmers engage in relatively modest types of expansion, it is worth asking why the size structure of the dairy sector is changing so rapidly. A key lies in how the balance of entry and exit trends over time can produce notable impacts on the overall structural characteristics of the aggregate dairy farm sector. Specifically, several studies in Wisconsin suggest that dairy farm entry rates are at historic lows while exit rates persist at relatively high levels. We used Census of Agriculture data to estimate the annual number of new dairy farmers who entered the sector, the number of dairy operations that closed, and the resulting net change in dairy farm numbers over the last 20 years (see Gale, 1994 for details on the methodology employed).

Figure 7 notes that the annual number of dairy farm exits in Wisconsin has held relatively

Figure 7: Estimated Number of Wisconsin Dairy Farm Entrants and Exiters, and Net Change in Dairy Farm Numbers per Year, 1978-1997.



steady — at between 1,800 and 2,000 a year — throughout the 1980s and 1990s. However, the number of new dairy operations fell dramatically from nearly 1,400 annually in the early 1980s to less than 350 annually between 1992 and 1997. The associated rapid increase in net dairy farm losses in the mid-1980s and 1990s is primarily the result of significantly fewer young people entering dairy, and not — contrary to most popular accounts — a product of more farm closings. (Of course, since the base of dairy farms is declining, the actual exit *rate* increases throughout the period).

Given that both exiters and entrants tend to operate smaller than average dairy farms, and that exiters now vastly outnumber new entrants, sheer demographic momentum — and not so much dramatic expansion activity among surviving farms — has produced much of the apparent growth in average herd size that we noted earlier. Put differently, a considerable proportion of structural change at the aggregate population level (in Wisconsin and in the United States) is the direct result of a growing imbalance between entry and exit rates, combined with the typical characteristics of the entrants and exiters.

COMPETITIVENESS OF MEDIUM-SIZED DAIRY FARMS

While medium-sized dairies remain important to the Wisconsin dairy sector, their position is definitely slipping relative to larger dairy operations. For most industry observers, higher rates of exit among small and medium sized dairies are usually attributed to a lack of economic competitiveness, linked to an inability to capitalize on economies of size. In this section, we examine some of the theoretical and empirical evidence for how economic competitiveness is related to the patterns of structural change noted above

There are a number of reasons why larger herd size may be associated with better dairy farm economic performance. First, volume premiums paid to large milk producers and volume discounts for large purchases of certain inputs are a likely source of size economies. So are the potential labor savings associated with the efficiencies of milking herds in parlors rather than in stanchions (Jones, 1999). In

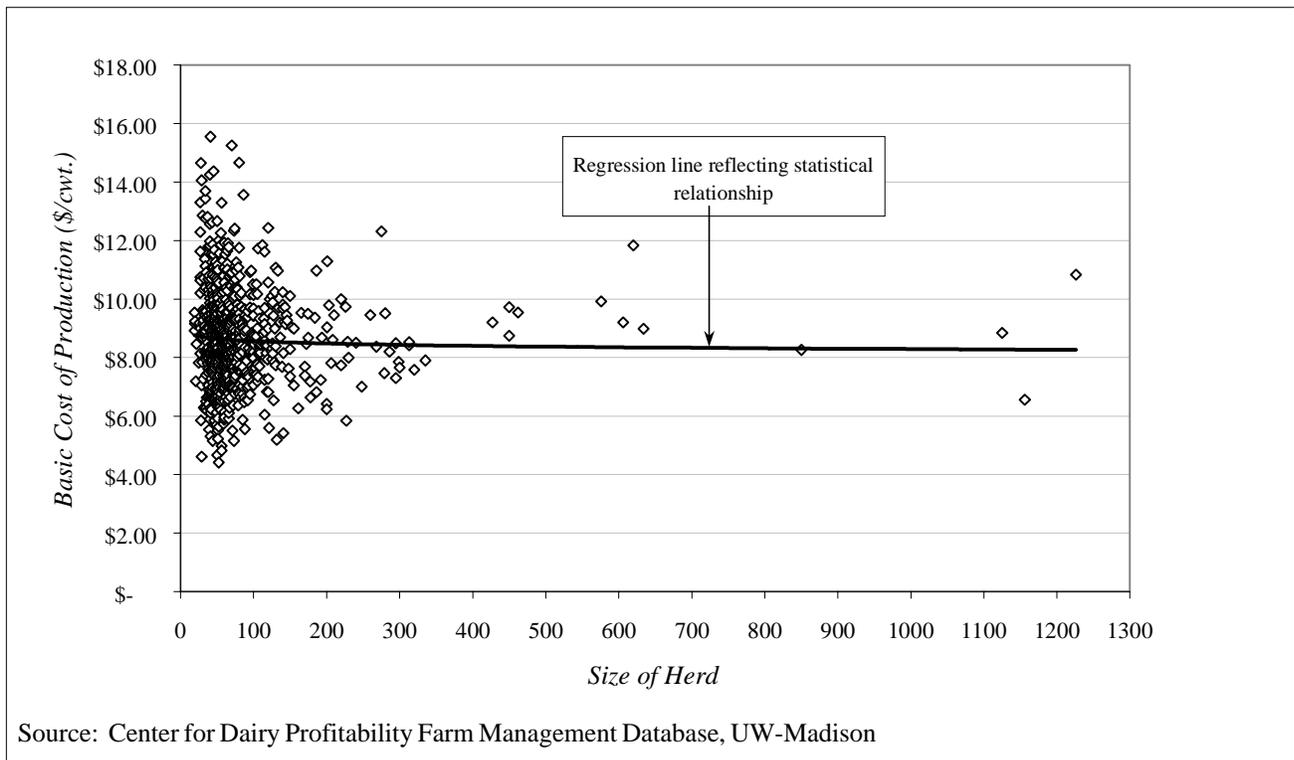
addition, larger operations may also be able to exploit modern milking facilities more efficiently by spreading the fixed costs of purchasing equipment or obtaining management information over a larger number of cows. Specialization in labor tasks on larger farms can also produce potential unit cost savings, though labor specialization strategies can occur on medium-sized operations as well.⁸

Many observers forget that larger size operations may also face serious diseconomies, especially in a management-sensitive activity like milking cows. For example, herd health, breeding, and nutritional management are critical to productivity and economic outcomes on dairy farms. Palmer et al. (2000) found evidence that Wisconsin dairy farms that had recently undergone major increases in herd size had reduced productivity per cow and were more likely to have higher cull rates or extended open periods where cows are not producing milk. In addition to increased management demands on operators of large farms, these operations are also more likely to rely on hired labor whose effort and capacities may not be comparable to an owner-operator for both incentive and experience reasons.

Recent empirical studies of Wisconsin dairy farms support the contention that size economies are either not present or if present are relatively small in Wisconsin's dairy sector. In a study of over 900 Wisconsin dairy farms, Frank and Vanderlin (1999) found that average total allocated costs per hundred weight of milk were actually about 10% lower on the 51 to 75 and 76-100 cow herds than on operations of over 250 cow herds. The statistical relationship between scale and basic costs of production produces a line that is essentially flat beyond 75-100 cow herds (Figure 8). Similar results were found 5 years earlier by Trechter and Splett (1994) and in recent case studies of 38 Farm Credit Services loan recipients in the Upper Midwest (Krutza, 1999). Recent data from Pennsylvania are consistent with these findings (Hoards Dairyman, 2000). Certainly, evidence from the actual farmer experiences suggest that the size economies in dairying are much less than suggested by engineering studies of new facilities that tend to assume away associated labor and management problems (Kriegl, 1998).

Perhaps just as importantly however, Jones (1999) shows that gains in herd productivity may be more important than increasing herd size in improving

Figure 8: Relationship between Herd Size and Basic Cost of Production, 1996.



the competitiveness of dairy farms in Wisconsin. In other words, differences in management ability and sophistication among farms with similar herd sizes tend to be much more dramatic than cost-differences across dairy farms of different scales. Kriegl (2000) has also shown how low-cost strategies involving the use of management intensive grazing can provide comparable net financial returns to operators in Wisconsin.

Ultimately, the individual decisions that shape aggregate patterns of structural change – whether to exit dairying, expand the herd, or stay put – are usually made by households, not business managers or absentee investors (Gasson and Errington, 1993). As such, they are likely to rest on more than just the unit costs of milk production or the rate of return on assets and labor generated by their dairy operation. Does one of the family members have a good off-farm job that helps to achieve income goals and other benefits? How important are intangible benefits — autonomy, working outside and with animals — of a farm career? Does the family value the quality of life offered by rural living and having their children or grandchildren grow up on a farm? Do they anticipate passing the farm on to a child or another family

member or friend? Conversely, do they see no future for the farm in their family? Or, are they tired of being tied to the farm and the relentless daily milking of cows?

Additionally, the fate of particular farm operations (of all sizes) will also be shaped by the market and institutional policy contexts in which they live and work. When comparing farm viability across regions, it is critical to take note of the federally mandated milk pricing system that pays producers in the Upper Midwest significantly lower prices than they would likely get in a more competitive free market pricing system (Cox et al., 1997). Regional labor markets also exert a strong influence over the viability of dairy farm operations, since tight overall labor markets and the absence of large pools of immigrant labor in the Upper Midwest make it expensive and often very difficult to find adequate nonfamily laborers to work on larger dairy farms. Similarly, local and state environmental and land use policies can influence the competitiveness and viability of dairy farms differently based on where you live and the size of your dairy herd. Declining farm numbers in some places may fall below the critical mass required to support a good infrastructure

of input suppliers, veterinarians, and processors that more densely populated dairy regions have. Finally, farmers living in states that invest in dairy-related university research, and that have county extension staff with expertise in dairy farming, may face different prospects than those who try to survive without the support of their public land grant institutions.

When considered next to these sorts of questions, the issue of survival of medium-sized family farms is more complex than one of looking at a single measure of economic competitiveness. In other words, there is no simple economic statistic, such as unit cost of production, that reveals the ideal farm size of the future or predicts patterns of structural change. Similarly, the relative rates of farm survival across regions (or across herds of different sizes in a single region) are not easily interpreted as *de facto* evidence of superior economic competitiveness. While it is likely that on average Wisconsin dairy will continue to grow bigger (with the increased presence of some significantly larger farms), both historical evidence and competitiveness measures suggest there is plenty of room for medium-sized family operations to continue playing a major role.

DISCUSSION AND CONCLUSIONS

Our detailed exploration of the underlying dynamics of structural change among Wisconsin dairy farms leads us to conclude that the industry changed gradually in the 1990s and that the future of dairying in Wisconsin and many similar “dairy belt” states will be one that is shaped by a number of factors. These include: (a) the continued presence of a large segment of medium-sized family-labor dairies, many of which will be expanding gradually and experimenting with new technologies and management practices that boost labor efficiency, milk output, household quality of life, and business profitability; (b) an increased number of relatively large dairy farms milking more than 200 cows in parlor/freestall facilities with significant hired nonfamily labor forces; and (c) significant growth in the number of dairy farms that seek to minimize unit costs by reducing labor and capital investments through the use of intensive grazing of improved pastures, purchased feeds, and low-cost milking and housing facilities like New Zealand-style swing parlors, flat barn parlors, and

greenhouses (Ostrom and Jackson-Smith, 2000). In addition, Wisconsin is likely to continue to see its share of national milk production (and dairy farms) decline relative to the more “industrial” dairy regions, but the state (and the other traditional dairy belt states) will remain a major force in the production of milk well into the future.

Our findings in Wisconsin suggest that the relatively simplistic view of structural change as an economically straightforward process of modernization and adjustment to new technical economies of scale is not very accurate. This may well challenge scholars who study structural change to revisit their assumptions about how and why farm structure changes in other regions. Though Wisconsin’s situation may be rather unique, until careful empirical work is done in other states and regions, we will not know for certain whether the patterns we observed are or are not typical of the processes elsewhere in the country. The fact that Wisconsin’s overall patterns of structural change are similar to national trends, and that research on the underlying microdynamics of change are similar to those observed in other places where detailed empirical data are available (e.g. in Canada, see Ehrensaft et al., 1984), provide ample reason to believe that similar results will be borne out elsewhere, particularly in other parts of the traditional dairy belt.

Aside from the significance of our findings for the academic community, the results have important implications for the land grant research and extension system. Although many throughout the industry believe that the family-labor, medium-sized dairy farm is no longer viable and that large-scale confinement operations will soon dominate Wisconsin’s dairy sector, this perception is perhaps nowhere more widespread than among the state’s public land grant researchers and extension personnel. As a result, the preponderance of land-grant research and extension efforts are aimed at assisting the large, technologically advanced dairy farm (Ostrom et al., 2000). For example, nutrition or reproduction research typically assumes higher levels of productivity, and concomitantly the use of facilities or technologies that are only seen on a minority of farms. Much contemporary manure and nutrient management research expects farmers to have lined manure storage facilities (while these are common only on farms in the over-100 cow category). “Modernization” extension efforts put almost exclusive

emphasis on large-scale investments in parlors and free-stall facilities. Finally, extension information delivery systems often assume that the farmer has a hired nutritionist, specialized labor force, and the ability to invest significant time and money into education and information acquisition.

By contrast, research targeted specifically for less intensive, medium-sized dairy operations is relatively rare, though recent efforts to study such practices as management intensive rotational grazing or low-cost (flat barn or swing) parlors are important counter examples (Jones, 1999; Kriegl, 1998, 2000; Kammel, 1998). While the focus on large dairy systems in Land Grant University research and extension has its roots in professional reward systems, personal interests of scientists, and other legitimate factors, they are reinforced by the interests of private agribusiness that are likely to see greater marketing opportunities with the largest dairy farms (who are likely to be more technology- and manage-

ment-intensive in their approach).

From a public policy point of view, there are several potential ill-effects of this tendency to focus research and extension almost exclusively on “cutting-edge” technologies and management systems. First, much less work is done on topics that may seem more mundane to the scientific community, but that may have widespread value to the farming community. Second, the land grant system will be increasingly vulnerable to declines in its legitimacy as an institution among farmers and the general public. Finally, the opportunity cost of not offering a range of strategies and programs for the medium-sized producers means that less may survive to become the farms of tomorrow. They may not be replaced by larger units fast enough to compensate for this foregone opportunity; consequently, the associated costs to rural communities, farm families, and farm-based businesses could be quite high.

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ENDNOTES

¹ These terms are used with specific definitions in mind. “Medium-sized” refers to farms that can be operated with predominantly farm family labor. Because of technological changes, the scale of dairy operation that might be called “medium-sized” has changed throughout the 20th century, though the concept remains relevant. “Diversified” dairy farms are those which raise a significant portion of their livestock feed on farm. “Family farms” are those where the ownership, labor, and management functions are all performed primarily or entirely by members of the farm operator’s family. Overall, medium-sized family dairy farms are markedly different than the large-herd, industrial-style dairy farms that are more typical of dairy states in the west and southwest. Industrial-style dairies refer to farms that use modern milking parlors and freestall confinement housing, often purchase the majority of their herd feed requirements, and rely principally on a hired non-family labor force. They also differ from, “small” dairy farms that are not big enough to productively employ available household labor, and usually rely mainly on off-farm income to survive.

² Most of the data used in this paper are drawn from ongoing research on dairy farm restructuring by staff of the Program on Agricultural Technology Studies at the University of Wisconsin-Madison.

³ Real milk prices were computed by dividing nominal all-milk prices by the published values for the U.S. Consumer Price Index.

⁴ We do not discuss herd contraction in much depth here, though many such adjustments are made. Usually, down-sizing is a step toward an eventual exit from the sector. However, some herd reductions are made in order to utilize labor and capital more efficiently, or to accommodate family quality of life or lifestyle concerns. We observed that expansions are more common than contractions among continuing operators.

⁵ The 1997 Wisconsin Dairy Farm Poll was sent to a random sample of Wisconsin dairy farm operations (obtained from dairy producer list maintained by the state Department of Agriculture, Trade, and Consumer Protection). Of the 2,098 surveys initially mailed out, 116 producers reported having quit dairying, and 1019 useable surveys were returned (producing a response rate of 51.2 percent). The characteristics of the responding dairies were compared to state estimates of the underlying size distribution of herds, and we determined that the sample was quite representative of the overall population though we had a very slight oversampling of larger dairy farms, and undersampling of the very smallest dairy farms.

⁶ It is important to recognize that the 1991 data do not include any of the operations that exited or quit dairy farming before 1997. Hence, the actual 1991 size distribution would likely include more small- and mid-sized dairies.

⁷ Using our specific definition of an entrant, we compared state lists of dairy farms from the spring of 1994 and the fall of 1995 to identify all new dairy farms that had begun operation over this period. Mail surveys were sent to all farms where new names appeared on the 1995 list that were not present in 1994. As reported in Buttel et al. (1999), we had about a 45% response rate, and received 320 completed and useable surveys from recent entrants who fit our definition.

⁸ Examples include management-intensive rotational grazing, whereby the producer can concentrate on managing pasture and herd performance, especially if grain is purchased rather than cultivated (Jackson-Smith et al., 1996). Similarly, some operators are going to a strategy of buying all of their feed and just concentrating on milking cows.

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